AIR TRAFFIC
DSR EVOLUTION TEAM
MEETING # 28

AUGUST 14 – 16, 2001
ANCHORAGE ARTCC
ANCHORAGE, ALASKA

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SUMMARY

Robin Badger, Anchorage ARTCC (ZAN) 510 Manager, and Tim Crowley, NATCA Facility Rep. welcomed ATDET to ZAN. The group engaged in an initial conversation to clearly understand the purpose of the visit and the expectations. Tracey Collins and Keven DeBoard, ATDET Co-Leads, provided an overview of the role of ATDET and why the visit was so important. First, the overall goal of ATDET is to develop new ideas and integrate programs into the controller workstation. Even though ZAN doesn't have DSR, commitments have been made to keep Micro-EARTS on a parallel path as far as enhancements go. One of ATDET's main goals is the development of ERAM and that program has long-range goals of including ZAN in the overall ERAM program.

Keven and Tracey explained the ATDET need to learn all the perspectives of RVSM. ZAN is in a unique position to provide lessons learned on RVSM since they have been using it for some time and have had an indicator in the FDB. ZAN provided general information on the use of their Micro-EARTS system. They feel that it is a good system, but look forward to being included in the overall ERAM program which will hopefully provide them with identical systems as the other ARTCCs.

ATDET received a sector briefing on the operation and functions of Micro-EARTS. Members were allowed to interact with the system and many features and differences when compared to DSR were documented. The CHI features within Micro-EARTS were key elements of concern and interest. The presence of ADS-B aircraft operating within the Capstone area were of particular interest to the Team. Special attention was paided to the indicators in the FDB that indicated and highlighted ADS-B capability and conditions.

Robin and the staff at ZAN presented several presentations on the overall and specific operations of ZAN to include:

- ZAN Operational Overview
- Micro-EARTS Overview and History
- Offshore Computer System (FDP System)
- Capstone ADS-B
- ZAN Information Display System
- RVSM Program

Discussions were held and information was exchanged on each of the above briefed programs. Discussions were reinforced by viewing and interacting with actual systems in the operations area.

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Anchorage ARTCC
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Welcome:

Robin Badger, Anchorage ARTCC (ZAN) 510 Manager, and Tim Crowley, NATCA Facility Rep. welcomed ATDET to ZAN. The group engaged in an initial conversation to clearly understand the purpose of the visit and the expectations. Tracey Collins and Keven DeBoard, ATDET Co-Leads, provided an overview of the role of ATDET and why the visit was so important. First, the overall goal of ATDET is to develop new ideas and integrate programs into the controller workstation. Even though ZAN doesn't have DSR, commitments have been made to keep Micro-EARTS on a parallel path as far as enhancements go. One of ATDET's main goals is the development of ERAM and that program has long range goals of including ZAN in the overall ERAM program

ZAN is in the forefront of new programs with ADS-B and RVSM and ATDET wants to clearly understand the programs and any lessons learned that will assist them in the future development of the national programs. ATDET also would like to understand the differences between DSR and Micro-EARTS.

Overview Discussions:

Keven and Tracey explained the ATDET need to learn all perspectives of RVSM. Since ZAN has been using it for some time, and has an indicator in the FDB, their lessons learned are vital to the development of the national program. Robin advised that most controllers don't like the current CHI for RVSM and they have been waiting for an ATDET solution that could be used universally. Tim added that they implemented RVSM based on the information they had at that time and they have some problems with the FDB indicator and with conflict alert.

ZAN feels that Micro-EARTS is a good system, but has some identified problems. They feel they don't have the tools that DSR has now and has planned for the future. They are excited about the possibility of being included in the ERAM program in the future. Since Micro-EARTS is planned for use within ATOPS and a candidate SDP system for ERAM, they are concerned that they may become "Guinea Pigs" for development. Keven gave his perspective on how ERAM may evolve. Tim inquired as to whether ZAN might receive any new functions as they are developed? No one knows that answer now. ZAN is nervous with all the potential changes that may be coming in the future. Keven explained his understanding of a meeting held about two years ago concerning the development of the en route system at ZAN with Jeff Griffith. ZAN was promised trips

to other facilities to see other equipment and developed features; especially tools that might be integrated into ZAN's baseline system.
David McNeel, ZAN NATCA, advised that in the future, ZAN might be alone with their current system. As he understands it, the STARS system is being modified to allow some en route functions and will be installed as the baseline system at places like Guam, Hawaii, San Juan, etc. Tim asked why ZAN was developing new CHI for Micro-EARTS if Lockheed Martin (LM) already has CHI developed that they are showcasing. Keven advised that from what he had seen, LM had only developed CHI emulation that is usually demonstrated on a PC rather than on a MDM.

Micro-EARTS Demonstration:

ATDET received a sector briefing on the operation and functions of Micro-EARTS. A control sector that was not in use was used with live traffic displayed. Interactions were possible without causing interference with any active control sectors. The following key points were discussed and documented as ATDET members were allowed to interact with the system:

- ADS-B equipped aircraft display a target that is oriented in the vertical position rather than in the standard slanted configuration.
- A limited datablock on an ADS-B aircraft with that equipment "On" will display a unique data string (for aircraft identification), and altitude and speed information.
- Micro-EARTS has a much different set of brightness controls
- Micro-EARTS allows much more control of maps by sector.
- Conflict alert provides an audible alarm at the specific sector.
- RVSM equipped and capable aircraft display an Orange altitude in the FDB.
- Micro-EARTS has no individual control of leader line lengths.
- No Dwell or Dwell Lock is available.
- Trackball route readout will be implemented soon.
- The Radar position does not communicate with the Associate position except when altitude changes are made.
- Within the Capstone area, ADS-B and radar targets use the same separation criteria.
- ADS-B updates targets every 1 second, and vector lengths every 1 second. The program has been changed to only update the histories every 6 seconds. The history retention at the 1 second update rate was a distraction for the controllers.
- ADS-B is scheduled to be deployed in the Juneau area next.
- A moving map display in the aircraft is a feature of ADS-B.
- Letters are used for sector identifiers and they flash within the FDB during handoff.
- Specific, approved navigation procedures are available for Alaska Airlines. These procedures are called Reduced Navigation Procedures (RNP). Only Alaska Airlines is authorized to utilize these procedures.
- Micro-EARTS has partial datablocks that include beacon code, altitude, and speed.
- Brightness Control Groups (BCGs) are available to control most displayed data except leader lines.
- Micro-EARTS has no Pointout capability. Pointout capability is scheduled to be available soon. They currently use a "flash through" procedure as an approved "AIT".

- The system does not have Computer Identification (CID). Most controllers use trackball for entries. Keyboard entries are available, but seldom used.
- They have not tried a Mouse as a possible replacement for the trackball.
- Micro-EARTS has a "backlit" keyboard.
- They have range rings with separate BCG.
- One of the main reasons they now use Micro-EARTS is the inability of HOST to handle the large sterographic plane and converging latitudes requirements.
- Requirements are being developed for STARS modifications that will allow that system to provide some en route capabilities.
- They have a limited capability of range/bearing. They hope to get Continuous Range in the future.
- They have no capability to display any weather on the Radar display. Primary radar was turned off last year.
- They will soon change the sector identifiers from letters to numbers to allow future expansion.
- Don't have the same "Coast Track" capability as DSR. A Coast Track moves immediately to a Coast List. They have asked for improvements in this function.
- Micro-EARTS has a different display status area.
- Micro-EARTS has no J-Ring capability.
- The Conflict Alert capability is not as good as DSR. Alerts are not received in time to ensure a smooth resolution of the problem as compared to HOST capabilities.
- Micro-EARTS has been a very reliable system.
- Micro-EARTS has a backup system, but not fully redundant.
- Processes inputs from as many as 50 sites and can handle varied types such as long range, short range, ADS-A and ADS-B.
- System can utilize 3-mile separation within 40 miles of radar site in the Kenai region only.
- Currently have no functional auto traffic count.
- The current priority of surveillance is:
    - Beacon (Secondary)
    - Primary
    - ADS-B
- ZAN anticipates that it will soon accomplish some type of analysis to determine if the ADS-B surveillance data can be moved up on the priority list to number one.

Anchorage ARTCC Overview:

Robin conducted a presentation on the overall operation of the ARTCC. The presentation focused on the uniqueness of the Anchorage airspace, geography, procedures, and ATC equipment used. Many of these unique features are determinants in many of the facility operations to include:

- More than 2.1 million square miles of airspace.
- Most of the Alaskan land area is inaccessible by vehicle, necessitating a high need for air traffic services.
- Radar coverage is limited to 55% to 60% of the airspace.

- Traditional radar coverage, where available, is only provided, on average, above 10,000 MSL.
- ADS-B is a new technology that enables additional surveillance in non-radar areas.
- Alaska's vast size and diverse terrain make it host to a variety of weather conditions:
    - Extreme Surface Temperature Changes
    - Pressure Variations
    - Record Snows
    - Ice Fog
    - Torrential Rains
    - Earthquakes
    - Volcanic Eruptions
    - Thunderstorms, funnel clouds, and tornadoes
- ZAN has 14 non-stratified sectors divided into two areas of specialty, East and West.
- Oceanic airspace is contained in 3 sectors.
- Military airspace encompasses approximately 60,780 square miles.
- Anchorage ARTCC interacts with 10 Area Control Centers in the International community:
    - Tokyo
    - Vancouver, Edmonton
    - Reyjavik, Petropavlovsk-Kamchatski, Norilsk, Mys Schmidta, Tiksi, Anadyr
    - Oakland
- Developing Changes include:
    - Micro-EARTS hardware and software upgrades
    - New Radar sites
    - Current Radar site upgrades
    - Deployment of FDP2000 enhanced FDP system
    - Expansion of Capstone ADS-B program
    - Improvements to ESIS and other Information Display Systems
    - Airspace changes including new stratified sectors

Micro-EARTS Overview and History:

John Turner, AOS Manager provided a presentation on the history of Micro-EARTS. This system is a Commercial Off-The-Shelf Radar Data Processor with the software written in C Programming Language. One of the main drivers for selecting this system was the capability to process data over a very large sterographic plane that is required for Anchorage's airspace. It can receive inputs from as many as 50 varied surveillance systems, process up to 2,500 active tracks, and process up to 1,800 flight data files. The system was declared IOC in the new control room in November of 1998. Since then, the software and hardware has been upgraded several times to add functionality such as ADS-B and multiple tower controller workstations.

Offshore Computer System (OCS):

The Anchorage staff briefed ATDET on the OCS system currently used at ZAN.

OCS is the locally developed Flight Data Processing System for Anchorage ARTCC. The system provides all of the Flight Data Processing for the entire Alaskan Region. It handles both the domestic and oceanic airspace and emulates NAS flight data type messages. It also has the capability to handle multi-sector Oceanic Datalink. OCS allows automated interfacility data communications with Vancouver Center and also interfaces with many other systems such as ETMS, DOTS, ARINC, NADIN, NORAD, and Micro-EARTS.

OCS utilizes commercial hardware platforms and supports a number of regularly used devices such as line printers, tape drives, DSR displays, FDIO displays, keyboards, and printers and is capable of connectivity via the EtherNet Lan or RS-232 Serial ports. Since it was commissioned in 1984, it has been upgraded often to accommodate the growing needs of the system. There are no geographical boundaries on airspace and it has the capability to execute calculations using spherical trigonometry.

A major upgrade to the system is currently being developed called FDP2000. It will rehost existing functionality to UNIX servers (HP9000). The core software is being rewritten in C/C++ utilizing ORACLE relational database manager. It will retain the existing interfaces and add new capabilities for display and weather. It will also add new capabilities to update flights with CPDLC messages, add interfacility communications with other international facilities, enhance the Upper Wind model, and provide ADS support and update of flight information. This modern platform will allow many future enhancements.

CAPSTONE--ADS-B:

ATDET was provided a presentation on Capstone. Capstone is the overall program to utilize GPS capabilities (ADS-B) to improve safety and efficiency in Alaska where radar coverage is lacking at lower altitudes. For this prototype system, the government furnished all of the ground-based equipment and avionics for up to 150 aircraft. A ground network of Ground Broadcast Transceivers (GBT) allows digital datalink communications between aircraft and between aircraft and ground stations. Selected airports in the target area have GPS approaches approved and published for use by the equipped aircraft. Aircraft avionics allow the cockpit display of Traffic Information System (TIS), Flight Information System (FIS), Real Time Weather, and moving terrain mapping. The ZAN Micro-EARTS has been modified to display ADS-B targets and aircraft performance information.

A limited part of Capstone is now operational in the vicinity of Bethel with approximately 115 aircraft equipped and two certified GBTs. Additional GBTs are being tested and pilot training is being accomplished to further expand the program incrementally.

Planning for Phase II is ongoing and this phase will concentrate on airspace in the vicinity of Juneau. It will endeavor to enhance the system by developing more useable IFR infrastructures such as airways with lower MEAs, enhanced surveillance coverage,

improved navigation via WAAS, Controlled Flight Into Terrain (CFIT) Avoidance, Improved TIS and FIS, and more AWOS stations.

Air Traffic Controllers at ZAN are currently using ADS-B surveillance targets for separation in the approved area around Bethel. Generally, the use of ADS-B is at lower altitudes where radar coverage is weak. The SDP system uses the following priority for target display: Beacon (Secondary), Primary, then ADS-B. If a beacon target is interrogated, it is displayed. If the beacon target is not seen by the radar, and no primary is seen, then the ADS-B signal is processed and displayed. The same separation criterion is applied to all displayed targets and both MSAW and Conflict Alert functions the same, regardless of target type. Unassociated ADS-B targets and histories are displayed as horizontal lines, while ADS-B associated targets and histories are displayed as vertical bars. An unassociated target has two lines of displayed data, including a specific aircraft code, altitude and speed. When a target is associated, the aircraft callsign replaces the code and the target and histories will change to a vertical configuration. There is an anonymous state whereby an aircraft can select a setting that will not display any aircraft code; but the term "VFR" in the first line of the "limited datablock". The term Radar Contact is used for both beacon and ADS-B targets and the standard 5 mile separation is applied for both.

Future system enhancements are:

- Stratification filters in Micro-EARTS for true altitude filtering
- Priority review, with goal of moving ADS-B to number one
- Future implementation of ADS-B in Juneau area

ADS-B Discussion:

ATDET and ZAN personnel engaged in an overall discussion on ADS-B and the following key points were documented:

- Capstone is considered a flight standards program
- It is also a political initiative that involves safety, commerce, etc.
- The cockpit equipment that was developed by UPS provides most of the same benefits as TCAS and is referred to as a "Cheap TCAS"
- The system is very similar to the Alaskan Airlines RNP system
- Pilot training on ADS-B has been somewhat of a problem since there is such a large turnover of pilots
- Around the Juneau area, where the radar coverage is very poor, transponders have been removed from many aircraft
- On ADS-B equipped aircraft, pilots can see the position of other ADS-B aircraft on a display in the cockpit; but they currently can't see other aircraft that are only transponder equipped such as Alaskan Airlines
- The overall goal of the program is to work toward multi-lateration where several different types of surveillance data will be mixed and averaged to present a target location
- GBTs are very cheap when compared to radar and other instrument systems

- Pilots will be able to get many types of flight information through the ADS-B system such as weather, TIS, FIS, etc.
- Another goal is to be able to mix radar and ADS-B data and send it back to the aircraft for use
- All ADS-B tracked data is sent to Volpe for inclusion in the tracking system. Unassociated targets are included in this and this has caused some perceived privacy problems with some of the pilots
- An "Ident" feature for the ADS-B system has been identified as a need and is being developed
- There are many flight data management issues that must be addressed
- Currently if an aircraft departs VFR and plans to pickup an IFR clearance, you still get an auto acquire

Information Display Systems:

Ron Mohr of the ZAN staff, provided ATDET with an informative presentation on the display systems that are currently used and are being developed. ZAN currently uses the recently fielded ESIS system. In addition to that, they are developing a local information display system that can be utilized at the sector/position level. ZAN is equipped with the ISSS original hardware that includes a 17" monitor mounted above the sector MDM. The plans are to complete development of the locally developed system and port it to those displays for sector selectable use.

The following key attributes of that developing system were documented during the presentation and discussions:

- Most items and features are user selectable by sector/position
- Information is color coded by information type
  - Green - Traffic Management
  - Blue - Airspace
  - Yellow - Outages
- Sorting of information is allowed by area and by sector/sectors
- System is capable of receiving data via either manual or auto means
- You can select varying times to post outages - from 35 minutes to 6 hours
- Can display HF frequencies and toggle between display and hide for quick access
- The TMU portion of the system queries the database every 5 minutes for data
- Has a "Notes" section that allows entry of any "Free Text"
- Can click on certain areas of display screen to toggle between varying pages for quick access to data
- Can right click anywhere on screen to display a popup menu to provide entry/change options for all screens
- An ATC information area includes such items as 7110.65, NOTAM list, Russian slot information, SOPs, Non-RVSM, etc.
- Has a "Roledex" type of selection area that has information on things such as facilities, tools, lookup capability, operating hours, and a "other" category
- The user interface is a trackball with a popup keyboard

- Includes a flight level converter
- Has a color legend for highlighting entries
- Includes a temperature converter
- Has a lookup capability that now operates with an internal database only
- All approach plates are scanned in system in inverse video

ZAN has a strong interest in the developing ERIDS systems. Keven and Tracey were able to access the ERIDS development site at CSC through the ATDET Web Site and provide a hands-on demonstration of the software. As with the other emerging ERAM programs, ZAN wants to be included in this program.

ZAN's RVSM Program:

The ZAN staff and ATDET had a lengthy discussion on the RVSM program at ZAN. Since RVSM has been active at ZAN for some time, ATDET had a particular interest in any program issues and lessons learned. The following points were documented during the discussions:

- ZAN workgroup started work on RVSM CHI and Procedures thinking it would be an oceanic program only and took the program too lightly
- Now--almost every sector is considered "Oceanic" and the program is much larger than first anticipated
- RVSM is done everywhere now except the "Sea Corridor"
- The Workgroup picked the "Orange Altitude" to indicate RVSM qualified
- In the West areas where almost everyone is RVSM qualified, it works pretty well
- In the East where there is a mix of aircraft, it doesn't work as well
- ZAN recommends keeping RVSM and non-RVSM aircraft segregated
- As far as the "Orange Altitude" for RVSM qualified aircraft--they feel controllers start to ignore the color
- They recommend that you use an indicator for non-RVSM aircraft rather than RVSM aircraft and only in RVSM airspace
- Overall, controllers seem to like RVSM since it provides more options; however, they feel you must be cautious since you may get setup for errors
- Tom Morgan interjected that ZSE doesn't have many problems using it now, but they have much less RVSM volume than ZAN
- Keven explained to the group how Europe went through their process and arrived at the "Big Bang" implementation strategy for RVSM
- ZAN advised that Alaskan Airlines does not have RVSM capability
- Tracey asked how the "Orange Altitude" was selected? No one could remember exactly how it was selected
- Were symbols considered in place of or in addition to color changes? Yes, we considered symbols and based on lessons learned, we selected symbols for indicating ADS-B capability
- Some controllers use different altitudes while others use procedural separation
- Conflict alert does not alarm at 1,000 feet; only when "metal to metal" is predicted

- Jeff Phillips feels most controllers will simply use radar vectors for separation rather than deal with the potential problems with a mixture of RVSM and non-RVSM

The overall discussion was very beneficial to ATDET. Even though ATDET has not reached final CHI decisions, the direction they are going was validated by the lessons learned from the ZAN experiences.

Micro-EARTS:

The group went back to the control room to interact with the Micro-EARTS system again and documented the following attributes:

- Middle click on trackball provides a Flight Plan Readout
- They currently don't have any method to distinguish between overlapping FDBs
- The increment/decrement feature for changing values uses Pick/Home rather than Pick/Enter
- The position symbol will soon go away
- A limited datablock includes the code, altitude and speed
- Each sector get aural alarms for alerts
- A Status Area is available in textual format and can be iconified
- No Views go Opaque
- The ATC Function Box will go away in the future
- There are no "Up Arrows" or "Down Arrows" displayable in the FDB
- System has a 4 digit scratch pad in Line 3 (time shares with Speed and Handoff fields)
- System has an auto-offset; but it is seldom used
- They are unable to adjust the cursor speed. They hope to have this capability in the future
- They can not filter by beacon code
- They can put a "box" around any VFR target
- The system uses one large map
- The system has many features; but most features are only accessible through a View that must be displayed
- Multi-Func Z brings up the type aircraft on all aircraft and it time shares with Free Text
- Click "Enter" while cursor is over a target to display a data string on that aircraft
- You are able to "pull out" specific buttons from Views and create a "Mini Toolbar" for frequently used features. Main Views can be closed after selection of the specific features are selected
- System does not place any "Pref. Routes" on strips
- When aircraft Ident, Speed is replaced with flashing "ID" in datablock
- The system is built with all features selectable "On/Off" to allow individual tailoring of each sector/position
- The current target symbol is sector letter designator
- The sending controller's FDB flashes after it has been taken by the receiving controller

- The receiving controller's FDB flashes until taken
- Tom noticed that the callsign for ADS-B aircraft was Green and inquired about it. ZAN advised that they don't pay much attention to target symbols so the colored callsign is seen as "helpful"

ATDET Business:

The next scheduled ATDET meeting is scheduled for August 28-31, 2001 at the W.J. Hughes Technical Center in Atlantic City, NJ. The following items are tentatively on the agenda for that meeting:

- Demonstration on hardware for R-Side Tech Refresh
- Demonstration on ERAM SDP candidate system
- ERIDS hardware and software verification
- URET Build 2 development activities with URET Team

Attendance List
July 10-13, 2001—Meeting # 26

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